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HAND STRENGTH EXERCISER AND PROGRESS INDICATOR FOR BOTH STRONG AND WEAK HANDS

BACKGROUND OF THE INVENTION

The present invention relates to the field of exercising devices.

There is a need for exercising the hands in order to strengthen them over a period of time. There is also a need for indicating the progress made over the time period to encourage the exerciser to continue with the exercising routine and note his or her progress. It is desirable to provide a single device for exercising both hands in a pleasant and rhythmic fashion over an exercising interval while noting the forces produced by each hand. The exercising intervals may be performed for several weeks or more, and thus by observing and recording the measured increases of impulse pressure due to the hand squeezing process, the hopefully improving hand strengths can be individually indicated for both the right and left hands.

It is also desirable to provide a single device that can be used in the manner described for exercising and indicating the substantial hand strengths of a strong body builder and the modest hand strengths of a frail elderly person with arthritis or a similar condition, and persons having hand strengths in between these two extremes.

The aforesaid desired desired goals have not been met by the prior art retrieved during our pre-examination search. Hallerman 4,222,560 discloses a plurality of exercising devices for squeezing fluids to accommodate various hand strengths, each device requiring different squeeze forces. Dikeman 4,114,449 discloses a hand exercising device employing a single fluid filled bulb that is squeezed by one hand. The greater the squeezing pressure, the greater the displacement of a hand squeezing pressure measuring indicating member by the fluid against the compressibility action of trapped air that resists the motion of the indicating member. Thus, the fluid under compression is blocked by the movable indicator. Smith 4,530,496 has a similar arrangement with an optional pressure gage G in figure 5. Again, the fluid under compression is blocked by the movable indicator. This is in sharp contrast with the present invention, whereby fluid is forced completely through a twin pair of valves that "self adjust" to the degree of squeezing pressure. This means that the single device of the present invention can be used to continuously exercise the hands of persons having widely varying strengths over a substantial time period for exercising the hands, whereas the devices of the latter two references are not conducive to exercising the hands, and certainly not two hands over a substantial time period.

BRIEF SUMMARY OF PREFERRED EMBODIMENTS OF THE INVENTION

An exercising device for strengthening hands or limbs has first and second bladders containing fluid with first and second valves that couple the bladders to a fluid pressure gage. Squeezing the left hand

bladder by the left hand causes easy flow to the right through the first valve to the pressure gage whereas the second valve presents a high impedance to flow in the same direction into the right hand bladder, so that the peak measured gage impulse pressure is proportional to the flow rate of fluid through the second valve indicating left hand strength.

Subsequent squeezing of the second bladder by the right hand produces fluid flow from right to left, to cause the fluid to easily flow through the second valve but to encounter substantial resistance through the first valve. Alternate bladder squeezing creates a pleasant rhythmic exercise routine and the peak gage pressure readings over time indicate progress in building up strength. The two specially designed valves together present a substantially constant fluid impedance from right to left and from left to right so that indicated gage pressure readings can be higher for a strong right hand for example, relative to a weaker left hand. Also, the special valve configuration enables large dynamic range pressure variations with one exercising device to enable both the weak and very strong to use the same device. A person with arthritis can transfer fluid from one bladder to the other at a very slow rate with little force being applied, to increase dexterity and strength in stiff and painful hands. In contrast, a "strong man" can produce very high mechanical impulse surges through the valves.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will become more apparent upon study of the following detailed description taken in conjunction with the drawings in which

Figure 1 discloses the presently preferred embodiment of the invention;

Figure 2 discloses the two part valves 4 and 5 of figure 1;

Figures 3-6 disclose the component valve disk members of valves 4 and 5 positioned from left to right as shown in figure 2.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

As shown in figure 1, first and second deflectable vessels in the form of flexible plastic bladders 1 and 2 are fluid coupled to a central pressure gage compartment 7, containing pressure gage 9, via conduits 3a and 3b and valve means 4 and 5. The entire apparatus is partially filled with fluid, preferably water. The bladders are configured to fit into the hands of the exerciser who alternately squeezes the left hand bladder 1 with his or her left hand and the right hand bladder 2 with his or her right hand. The flow 3 from squeezing the left hand bladder passes through conduit 3a and through two component valve 4, which presents a very low fluid impedance into the pressure gage compartment 7 at this time. However, valve means 5 at this time, presents a very high impedance to continued fluid flow from left to right into the substantially empty right hand bladder 2 via conduit 3b. This high impedance state of the right hand valve means 5 causes the peak impulse pressure to rapidly rise and be indicated by pressure gage

9 in compartment 7. Fluid flow from left to right is then terminated as the right hand bladder 2 receives most of the fluid formerly stored in the left hand bladder 1.

Now the right hand of the exerciser squeezes right hand bladder 2 to reverse the aforesaid procedure. Fluid flows from right to left through conduit 3b and the second two part valve means 5, which is now forced into a low impedance condition and valve means 4 is now forced into a high impedance condition causing the aforesaid peak pressure impulse to be again indicated by the pressure gage.

The first two part valve means 4 has a first circular valve member 12 affixed to mechanical ground by, for example support rod 6 and has a large passageway formed therein by a number of arcuate passageways 21 and 21a, shown in figures 2 and 3. The rod also supports a second valve member of figure 4 in the form of a circular disk 13 having a small orifice 17 therein, that is movable and can slide over support member 6.

In like manner, the second right hand valve means 5 has a circular valve member 14 affixed to mechanical ground by, for example a support rod 6 and has a large passageway formed therein by a number of curved passageways 22 and 22a, shown in figures 2 and 6. The rod also supports a second valve member of figure 5 in the form of a circular disk 16 having a small orifice 18 therein, that is movable and can slide over support member 6. The force of fluid from left to right as indicated by arrow 24 in figure 2 sees a low impedance to the flow

as disk 13 is pushed to the right and fluid flows through the large passageway formed by 21 and around the valve member 13 as indicated. At this time, the fluid flow pushes valve disk 16 to the right against valve member 14 so that fluid is forced to flow through tiny orifice 18 that presents the aforesaid high impedance which produces the needed fluid resistance for exercising the left hand and the peak fluid impulse is shown by gage 9. Most of the fluid is thus transferred from bladder 1 into bladder 2 and the stage is now set for the reverse fluid flow to exercise the right hand. The right hand squeeze action against the bladder forces movable disk 16 to the left and the right hand two part valve 5 now presents a low resistance to the fluid; the movable disk 13 is shifted to the left against valve member 12 and thus the left hand two part valve 4 now presents a high impedance because the fluid must pass through the tiny orifice 17, as member 13 is forced against the inner surface of valve member 12. In other words, each two part valve member presents alternate high and low impedances to the flow of fluid depending upon the direction of fluid flow. Stops 10 and 10a limit the motion of movable valve members 13 and 16. Members 12 and 14 could be movable while members 13 and 16 could be stationary so long as there is relative movement between the members.

Thus, squeezing the first bladder 1 by the left hand causes easy flow through the first valve 4 to the pressure gage 9 in a first direction from left to right, whereas the second valve 5 presents a high fluid flow resistance at this time into the right hand bladder, so that the measured gage impulse pressure is proportional to the flow rate of fluid through

the second valve, indicating left hand strength. Squeezing the second bladder by the right hand produces fluid flow in the opposite direction with the right hand strength being measured in like manner. Accordingly, the described valve configuration enables production of strength measurement data sets of the weak and the strong with one device. It will be apparent, owing to the described symmetrical valve configuration, that fluid impedance will be the substantially the same regardless of the flow from right to left and from left to right. Hence the two sets of pressure gage measurements can indicate the different measured strengths of the left and right hands, the latter often being stronger than the left hand.

Alternate bladder squeezing creates a pleasant rhythmic exercise routine and the peak gage pressure indicates progress. As the hands are strengthened, the increased squeeze force causes the flow rate or impulse through the device to increase, increasing the sharp peak impulse measured by the pressure gage.

The measured hand strength range is beneficially large facilitating use by both the strong and weak. During experimental use of the above described prototype, the maximum force exerted by the inventor's nine year old son registered four psi on the gage; his eighty year old mother registered five psi, and on a good day the inventor was able to register ten psi. If one was trying to do ten to fourteen repetitions per exercise set the gage readings would be smaller and for use as therapy for weak hands the peak pressures could be as low as one to two psi for twenty repetitions. Regardless, progress in

strengthening the hands would be indicated by increased pressure readings. The gage indications are thus proportional to mechanical impulse, namely the product of the average force acting upon a body and the time during which it acts.

Since variations on the foregoing may readily occur to the worker in the art, the scope of the invention is to be limited solely to the terms of the following claims and equivalents thereof. For example, valves having rotational flaps with two torsional springs of differing stiffness coefficients could conceivably be employed but the disclosed sturdy valve arrangements are greatly preferred. While the invention is primarily concerned with exercising the hands, other body portions such as leg portions may benefit.

I claim: